

**TIME: 1400 - 1700 HOURS**

Answer the question 1, which is compulsory, and five (05) additional questions.
Question 1 carries thirty (30) marks and questions 02 to 08 carry fourteen (14) marks each.

- a) Briefly explain the differences between renewable energy and non-renewable energy. (02%)
- b) Briefly explain the terms primary energy and secondary energy (02 %)
- c) Briefly explain what you understand by Carnot cycle. (02 %)
- d) Briefly explain what you understand by the term deaeration. (02 %)
- e) Explain what you understand by wet steam, dry steam and super heated steam. (02 %)
- g) Briefly explain what you mean by triple point and sublimation line. (02 %)
- h) What are the functions performed by heat exchangers? (02 %)
- k) Briefly explain the terms “Luminous flux” and “Luminous Intensity”. (02 %)
- l) Briefly explain the terms “Wet bulb temperature” and “Dew point temperature”. (02 %)
- m) Define terms given by following abbreviations related to water quality.
i) TDS ii) COD (02 %)
- n) Distinguish between the processes Suspended Growth and Attached Growth. (02%)
- o) Briefly explain how you measure a risk of a hazard (02%)
- p) What do you understand by the terms Safety Engineering and Safety Management (02%)

q) What do you understand by the term "Industrial Hygiene" (02%)

r) What are the differences between "Sedimentation" and "Coagulation" (02%)

02) a) With a aid of a diagram, explain how electricity is produced by electromagnetic induction (05%)

b) Energy losses are reduced by operating transmission lines, at high voltages. Explain why? (03%)

c) List out important parts and their main functions of a Coal Power Plant. (06%)

03) a) What are the three primary solar energy technologies? (02%)

b) Explain the main principle of photovoltaic technology (How it works). (04%)

c) Distinguish between the terms Nuclear Fission and Nuclear Fusion. Briefly explain three different types of nuclear reactors known to you. (08 %)

04) a) Draw enthalpy-temperature diagram for constant pressure formation of steam. Indicate liquid enthalpy, enthalpy of evaporation, enthalpy of dry saturated vapour and enthalpy of super-heated steam in this diagram. (04 %)

b) The wall of a room constructed with concrete and is 6m long, 2.5m high and 20cm thick. The inner surface of the wall is at 22 C and outer surface is at 35 C. Find the heat transfer rate through the wall. The coefficient of thermal conductivity of concrete is 0.5W/mK. (07 %)

c) What is the function of cooling tower (03%)

05) a) A lamp with a luminous intensity of 100 candle power is placed 2.5m above the floor. Lamp is at the middle of the room and its dimensions are 4.5m x 3.5m. Find the illumination,

- At a point on a table directly under the lamp (height of the table is 0.5m)
- At a corner of the room. (08%)

b) Calculate the specific enthalpy and specific internal energy of 85% dry steam under pressure of 6 bar (used given stream table for your calculation). (07%)

- 06) a) Explain the differences between the processes of adiabatic saturation and spraying hot water. (03 %)
- b) The spraying unit of an air conditioning plant takes in atmospheric air at 30 C and 45% relative humidity. Air leaving the spraying unit is saturated (100% R.H.). Draw this process on psychrometric chart and determine; (08 %)
- i. Temperature of air leaving the spray chamber.
- ii. The moisture contents before and after saturation.
- c) Distinguish between aerobic oxidation and anaerobic oxidation (03%)
- 07) a) Explain the process used in biological methods of effluent treatment (06%)
- b) Explain the terminology "Sedimentation" and "Coagulation" (02%)
- c) What types of impurities are removed in tertiary stages of waste water treatment process? Explain a process that is used to remove tertiary waste. (06%)
- 08 a) Briefly explain what you understand by the term "Industrial Hygiene" (03%)
- b) Give five different categories of industrial hazards and give two examples on each and effect of each type of hazard on the employee. (08%)
- c) What is the job of an industrial hyginists (03 %)